Derivation and Assessment of Vegetation Maps for Reindeer Pasture Analysis in Arctic European Russia

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Around one million semi-domesticated reindeer (*Rangifer tarandus*) live and graze on pasturelands in the European Arctic. The presence of this herbivorous species has a significant effect on the vegetation of the region and vegetation shifts, in response to climate change, cannot be properly interpreted without reference to reindeer herbivory. Profound issues such as overgrazing, and the relative importance of grazing and climate change in the decline of terricolous lichens, have arisen. It is thus of great importance to understand the relationships between reindeer grazing and tundra vegetation in the four countries of mainland European Arctic: Norway, Sweden, Finland and Russia. Particularly in Russia, detailed characterisations of vegetation distribution are not readily available and it is necessary to derive new vegetation maps through remote sensing methods or to consider the utility of less detailed vegetation maps. We approach this issue through an analysis of seasonal pastures in the Nenets Autonomous Okrug (NAO) in European Russia, where reindeer herding is a dominant livelihood. We examine a number of existing general satellite-based vegetation maps, particularly the Olson, CAVM (Circumpolar Arctic Vegetation Map) and JRC (Joint Research Centre) classifications, and compare them to seasonal pasture divisions. We also develop a more detailed vegetation map from Landsat-7 ETM+ imagery. In general, the analyses show that typical summer pasture vegetation is drier and located in well drained vegetation zones while winter pasture is located in lower-lying, wetter regions. Of the three circumpolar land cover classifications, the CAVM appears to correspond most closely to the seasonal differences in pasture use while the Olson classification performs the least well. Even so, the degree of correspondence between the CAVM, which is highly generalised, and pasture seasonality is not great and this strongly suggests the need for more specialised vegetation maps. In particular, we recommend the development of Arctic vegetation maps that provide more detailed information on lichen distribution, as well as the extension of the work described here to encompass other parts of the Arctic.